Montana Comprehensive Assessment System (MontCAS, Phase 2)

Criterion-Referenced Test (CRT)

Common Constructed-Response Item Release
Mathematics, Grade 10

2008

OPI

OFFICE OF PUBLIC INSTRUCTION

For information, contact Measured Progress, P.O. Box 1217, Dover, NH 03821-1217.
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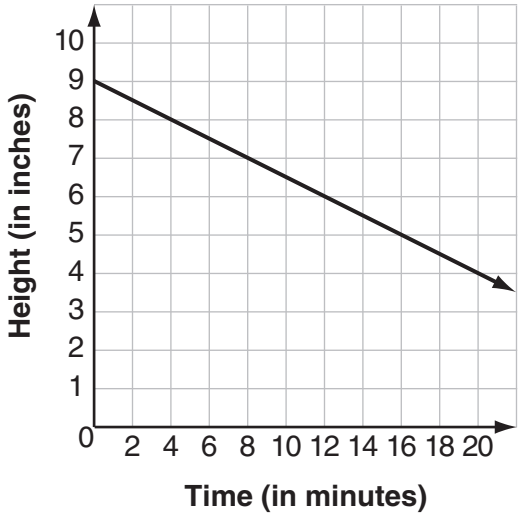
Mathematics
Session 1 (No Calculator)

You may NOT use a calculator during this session.

Write your answer in the space provided for it in your Student Response Booklet. Show all of your work.

23. The graph below shows the height of a candle as it burns.



a. What is the meaning of the *y*-intercept in this situation?

b. What is the meaning of the slope in this situation?

c. Write a linear equation that represents the height, *y*, in inches, of the candle when it has been burning for *x* minutes.

d. What is the *x*-intercept of the line? Show or explain how you found your answer.

Scoring Guide

Score	Description
4	5 points
3	3 or 4 points
2	2 points
1	1 point
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Scoring Notes

Part a:	1 point	for correct meaning
Part b:	1 point	for correct meaning
Part c:	1 point	for correct equation
Part d:	2 points	for correct answer, **36**, with work or explanation or for the correct answer with work based on incorrect c
	OR	
	1 point	for correct answer with incomplete or no work or explanation
		or
	1 point	for correct strategy with incorrect or missing answer

Sample Response:

Part a: The y-intercept is the height of the candle before it is burned.

Part b: The slope means that every 4 minutes the candle is 1 inch shorter.
or
The rate of change of the height of the candle over time (in inches per minute).
or
The slope means that every minute the height of the candle decreases by $\frac{1}{4}$ inch.

Note: Numbers not required for part b.

Part c: $y = -\frac{1}{4}x + 9$ (or equivalent)

Part d: $0 = -\frac{1}{4}x + 9$

$-9 = -\frac{1}{4}x$

$36 = x$ or (36, 0)

Score Point 4

Sample 1

A. It indicates how tall the candle was when it was lit

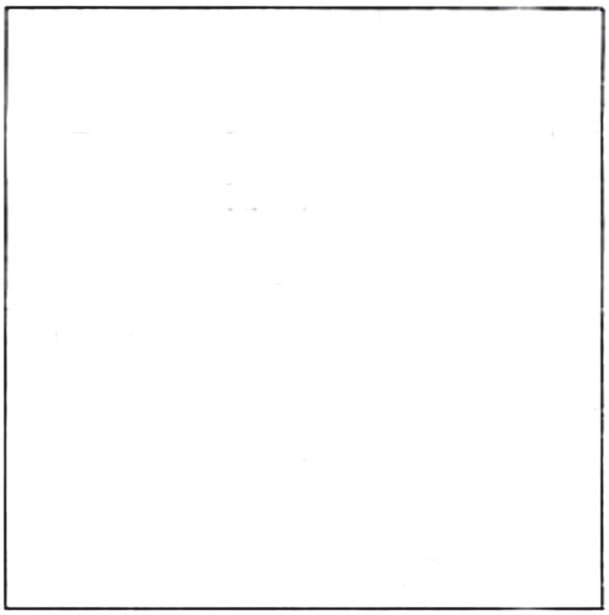
B. It is the rate at which the candle burns down.

C. $y = 9 - 0.25x$

D. $y = 9 - 0.25y$

$9 \div 0.25 = 36$

x intercept = 36



Score Point 4

Sample 2

a. The meaning of the y-intercept, 9 inches, on this graph is the height of the candle when it began to burn.

b. The slope, $-1/4$, on the graph indicates that the candle is decreasing one inch in height every 4 minutes.

c. $y = -1/4x + 9$

d. The x-intercept is 36 because if you keep decreasing 1 inch and increasing 4 minutes as the slope says, the candle will be burned out in 36 minutes.

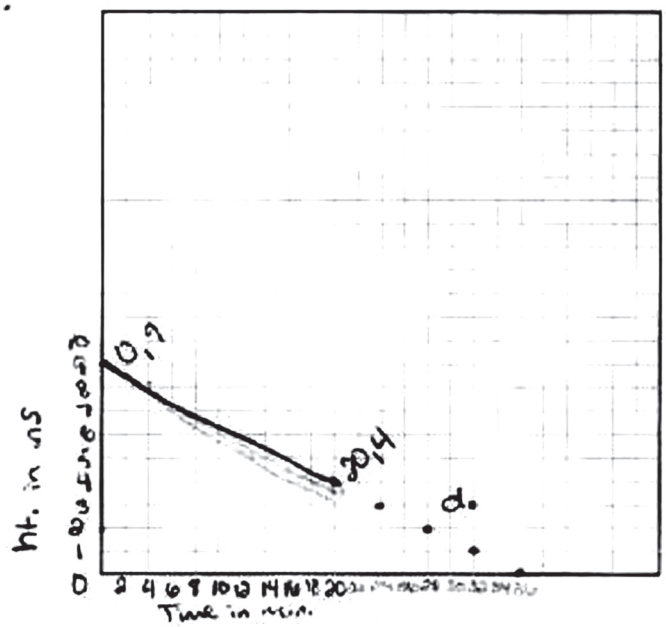
$m = \frac{4-9}{20-0} = \frac{-5}{20} = -1/4$

$y = -1/4x + 9$

$y = \frac{x}{4}$

$-7/1 \cdot -4/1$

$\frac{-28}{-1}$ $x = 28$



Score Point 3

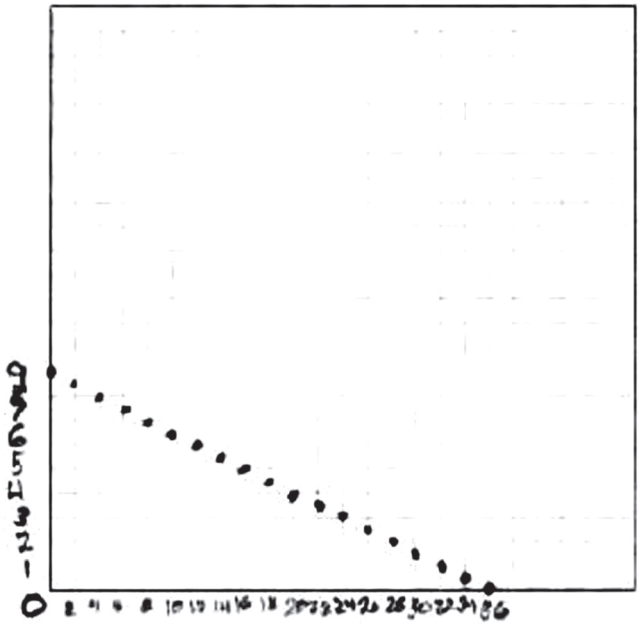
Sample 1

a. The starting Heighth

b. How much Heighth was lost per minute

c. $y = -\frac{1}{2}x$

d xintercept = 36



Score Point 3

Sample 2

a. The height of the candle before it was lit.

b. The rate at which the candle height decreased as it burned.

c. $y = -\frac{1}{2}x + 9$

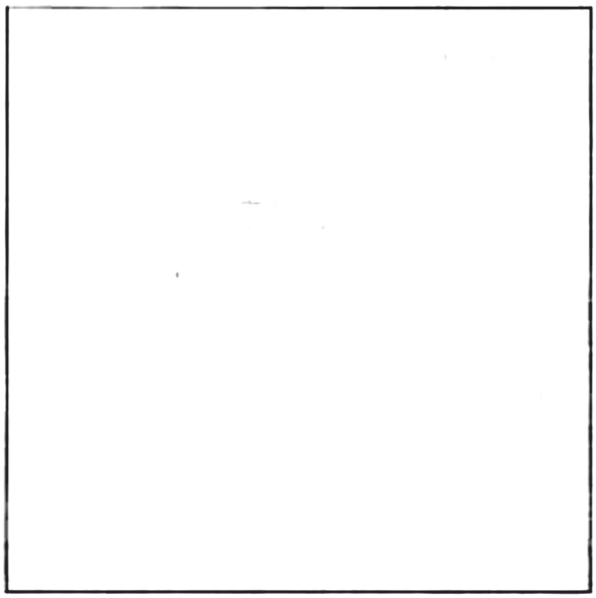
d. $0 = -\frac{1}{2}x + 9$

$-9 \quad -9$

$-9 = -\frac{1}{2} \times \frac{-2}{1}$

$-9 \cdot -2 = 18$

x intercept = (18, 0)

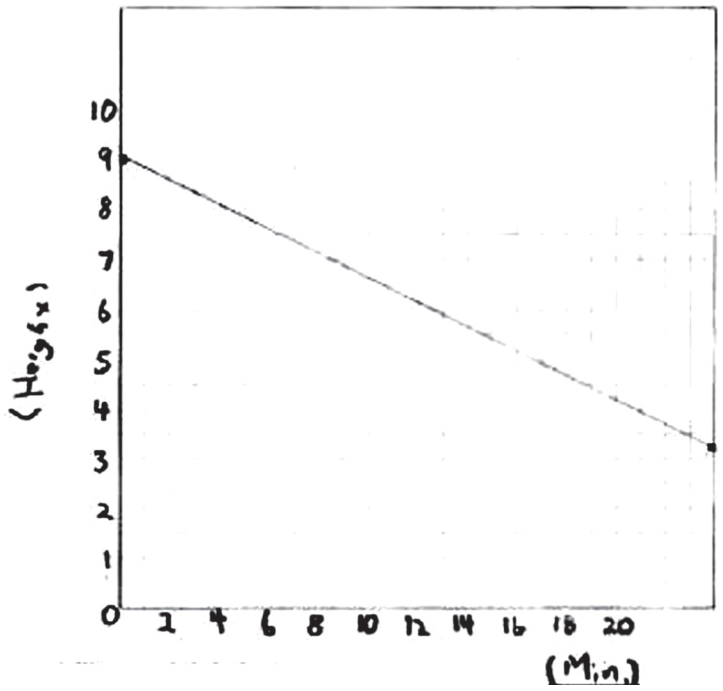


Score Point 2

a The y-intercept is the height of the candle at 9 inches. b The slope is how much the the candle is going down and how long it is taking it to do so.

c. $6 = \frac{1}{2}12$

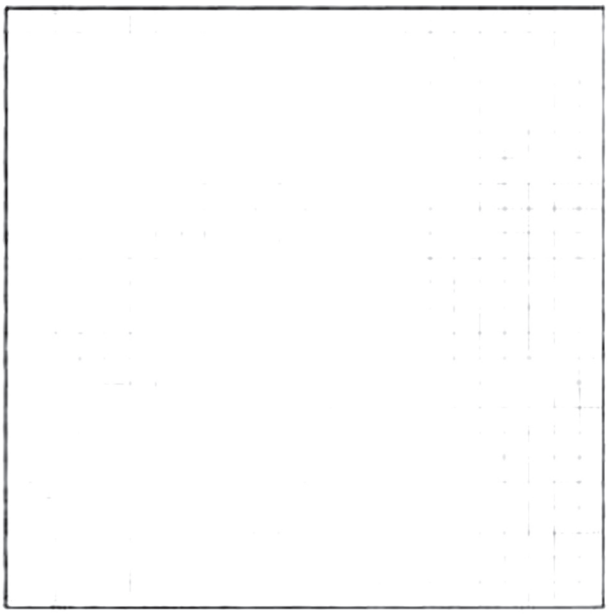
d. The x intercept is the minute it burns in 36 min. because every 4 min an inch burns off.



Score Point 1

Sample 1

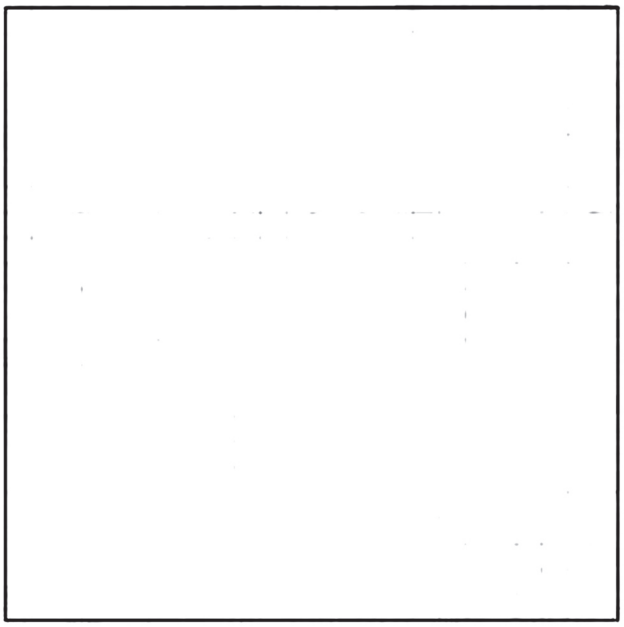
a) In this situation, the y intercept shows where the height in inches starts.
b) the slope shows the decrease in time.
c) yin. = Xmin.
d) 25; add on to both the graph and the slope.



Score Point 1

Sample 2

a. the height of the candle
b. how fast it burns
c. $y = -\frac{1}{2}x + 9$
d. 28, keep going down at the same rate



Score Point 0

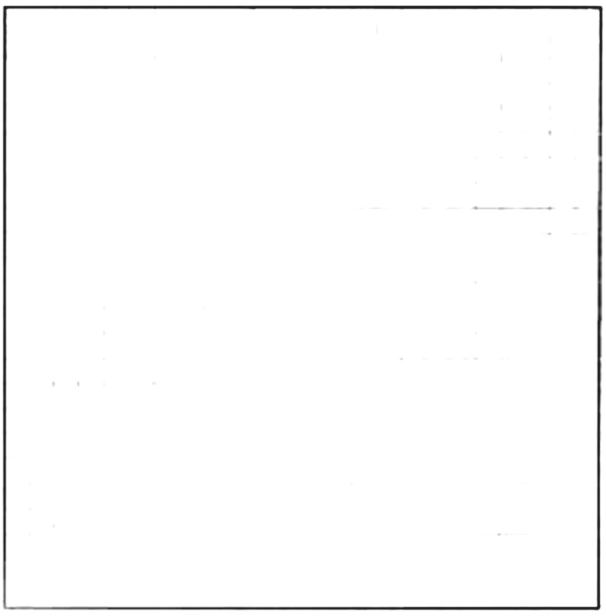
Sample 1

a. showing the time it took for the candle to get shorter or melt

b. Progress of the candle's height getting shorter

c. $y = \frac{-1}{2}x + 9$

d. 9, because that's where it crosses the y-axis.



Score Point 0

Sample 2

a. Height (in inches)
b. The time (in minutes)
c. $y = 2x4$
d. $x = 8$ 2x4